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An experiment in the neuroscience of learning interactions: The effect of agency on emotional processing in dyads learning physics with a serious computer game

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Abstract

Many educational approaches assume that making the learner active leads to better learning although this improvement in learning has not be firmly quantified experimentally. The goal of this paper is to articulate a model of agency in cooperative learning based on a predictive cognitive architecture and to explore methodological strategies as well as theoretical and applied implications of agency in the study of cooperative learning, in this case with data on emotional processing. Results from 27 dyads (1 player and 1 watcher) who played a serious game for learning physics for 120 minutes show that agency has no effect on the overall quantity of emotional processing, but that the emotional processing of a watcher and player is synchronized. A watchers emotional processing may precede or be delayed from the players. The cornerstone of this framework is the notion of predictions, which unites top-down and bottom-up influences as modulated by the possibility for action (agency). The model presented is the foundation for process-oriented studies of cooperative learning from an educational neuroscience perspective.